Report Number: WI-05-98

PULVERIZE, MILL & RELAY ASPHALTIC PAVEMENT & BASE COURSE

CONSTRUCTION REPORT

WISCONSIN TECHNOLOGY ADVANCEMENT
DEPARTMENT OF TRANSPORTATION

AUGUST 1999

PULVERIZE, MILL & RELAY
ASPHALTIC PAVEMENT & BASE COURSE

Study # ME 94-10

CONSTRUCTION REPORT
Report # WI-05-98

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PROJECT BACKGROUND

Full Depth Reclamation (FDR), a method of cold-in-place recycling, is a technique in which the full flexible pavement section and a portion of the base course are pulverized, crushed, blended and compacted to form a base for new asphaltic overlays. By addressing the entire pavement section, FDR is able to correct deficient cross sections, increase the load-bearing strength of the pavement structure, and utilize 100% of the existing materials thus preserving finite virgin aggregate sources and eliminating the need to landfill old pavement materials. In addition, it can restore the crown and slope and inhibit reflective cracking because all of the cracked asphalt is pulverized.

The first stage of the Pulverize and Relay research project collected data in 1996 on seven pulverize and relay projects. Field densities, proctor densities, compaction equipment and lift thickness data were collected and analyzed. Review of this data concluded that the initial portion of the study developed: 1) a testing procedure for measuring the density and water content of the re-laid material, 2) a database of project densities, and 3) a density test measurement protocol for construction.

After the Technical Oversight Committee (TOC) reviewed the 1996 data, it was decided that more information was needed regarding compaction of thick lifts. For this portion of the study, moisture and density data was collected on thick full-depth compacted test sections and compared to a split lift compacted control section of the same final thickness. In addition, different compaction equipment / methods were used and compared to determine their effectiveness as it relates to density.

It is anticipated that the findings from this study will be used to refine the Pulverize/Mill and Relay Asphaltic Pavement and Base Course Special Provision; more specifically, to verify if the provisions are adequate regarding thicker lifts and to determine if the specials can be changed to allow for construction of thicker lifts.

PROJECT OVERVIEW

Construction of test sections on STH 54 in Outagamie County (Figure 1) took place June 22nd - June 24th, 1998. Total project length was approximately 6.6 km (4.1 mi.) from Black Creek east to Seymour. As per the Work Plan, a control and two test sections were constructed with the control and test sections approximately 400 nominal meters (0.25 mi.) in length. Four additional test sections were added to this study and will be discussed in turn. In all, there are seven different test sections including the control sections (Figure 2). Ambient air temperatures were approximately 30° C. (86° F.) with sunny skies and high humidity.

The old asphaltic pavement was 203 mm (8 in.) thick. It was milled and pulverized to a depth of 254 mm (10 in.). This included 50 mm (2 in.) of the old base course. The 254 mm (10 in.) of pulverized material resulted in approximately 305 mm (12 in.) of pulverized material in a loose or "fluffy" state prior to compaction.

The new asphaltic pavement was laid down in 3 lifts with a tack coat applied in-between the lifts. The first lower layer was 50 mm (2 in.) thick. The second lower layer and the upper course were each 38 mm (1.5 in.) thick. Thus, total pavement thickness was 126 mm (5 in.).

TESTING PROCEDURE

Density measurements of the pulverized and compacted base were taken with a Troxler™ Nuclear Density Machine operating in direct transmission mode at 254 mm (10 in.) and 102 mm (4 in.). Measurements were also taken at 152 mm (6 in.) in Test Section 1, the split lift section. Care was taken in insuring a level surface prior to taking readings. Random numbers were used to identify measurement locations. These were modified for Test Section 2 in an effort to interject a bit of common sense for the testing locations as the random numbers obtained were all within a very small stretch of Section 2.

PROPOSED CONTROL SECTION (Std. Const. w/Split Lifts)

The Proposed Control Section (station 16 + 300 to station 16 + 700) was specified to be a standard construction method with split lifts as nearly even in thickness as possible, with a maximum difference of 25 mm (1 in.). For this control section, it was unclear whether the split lift compaction method was used as per the work plan due to the work being completed without witness. The density test results in Table 1 were obtained 48 hours after this section was constructed. In essence, this resulted in an "uncontrolled control" section. Consequently, an extra or Actual Control Section was constructed west of CTH PP (station 14 + 150 to station 14 + 550).

The variable density readings at 102 mm (4 in.) and 254 mm (10 in.) for the Proposed Control Section (Table 1) were likely a result of extensive grading or re-grading before the contractor established an effective method for grading commensurable amounts of pulverized material off and back on the roadway for compaction. Another contributing factor may have been the amount of construction traffic.

ACTUAL CONTROL SECTION (Std. Const. w/Split Lifts)

The Actual Control Section (station 14 + 150 to station 14 + 550) was added due to uncertainties regarding the efficacy of the Proposed Control Section. Two complete passes were made with a grader, a water truck, a vibratory pads foot roller and a vibratory steel wheeled roller. Density measurements at 102 mm (4 in.) and 254 mm (10 in.) were the most consistent of all sections, with only a 0.1% difference between the average density at the two depths (Table 1). In addition, this split lift section had the highest density average (94.2%) at the 254 mm (10 in.) depth and the second highest overall density average between the 102 mm (4 in.) and 254 mm (10 in.) depths.

TEST SECTION 1 (Split Lift)

Test Section 1 (station 14 + 800 to station 15 + 200) plans called for a 190 mm (7.5 in.) compacted first lift followed by a 90 mm (3.5 in.) second lift. The process consisted of grading off 90 mm (3.5 in.) of the pulverized material, compacting the remaining 190 mm (7.5 in.), grading back on the remaining 90 mm (3.5 in.) and then compacting that lift. Two complete passes were made with a grader, a water truck, a vibratory pads foot roller and a vibratory steel wheeled roller. This section had the highest average density for the 102 mm (4 in.) depth and the third highest overall density average (94.1%) between the 102 mm (4 in.) and 254 mm (10 in.) depths. It also had the second highest variation (3.5%) between the 102 mm (4 in.) and 254 mm (10 in.) depths. Density measurements were also taken at the 152 mm (6 in.) depth and were found to be less than the average density at both the 102 mm (4 in.) and 254 mm (10 in.) depths. See Table 3 for results.

TEST SECTION 2 (Full Depth)

Work plan test procedures for Test Section 2 (station 15 + 200 to station 15 + 600) called for a 280 mm (11 in.) compacted single lift. A vibratory pads foot roller, a rubber tired roller and a vibratory steel wheeled roller (in order) followed the water truck and grader.
Figure 3 shows the compaction equipment used on this project: an 11086 kg (24,500 lbs.) C852B Hyster vibratory pads foot roller, a 10973 kg (24,250 lbs.) vibratory steel wheeled roller, and a 24887 kg (55,000 lbs.) Caterpillar PF290B rubber tired roller. A water truck and an electronically-controlled grader preceded these during compaction. Three complete passes were made by this equipment train including two applications of water and final blading followed by a vibratory steel wheeled roller. Density measurements were fairly uniform, with only a 1.1% average difference at the 102 mm (4 in.) and 254 mm (10 in.) depths. The overall average density at both the 102 mm (4 in.) and 254 mm (10 in.) depths for this full depth test section is significantly lower (at the 90% confidence level) than the split lift sections (excluding the Proposed Control Section constructed without witness). See Table 2 for density measurement results.

This test section was re-tested the following day within 0.9 m (3 ft.) of the previous day's density testing sites / lots. It was thought that the material may "tighten up" or "bake" in the hot sun and thus improve density. However, no significant differences in density were recorded on these re-tested locations (Table 7).

TEST SECTION 3 (Full Depth Supplemental Test Section)

In addition to the work plan test sections, a supplemental full depth test section was added (station 14 + 460 to station 14 + 800) to determine if similar and sufficient densities could be achieved with a rubber tired roller used as the primary compactor. Two passes were made with a rubber tired roller and three passes were made with a vibratory steel wheeled roller with an application of water prior to and in between passes. **Density measurements were taken and found to be less than the areas (all other sections) worked with a vibratory pads foot roller (Table 4).** In addition, densities did *not* improve significantly after the area was reworked with a vibratory pads foot roller (Table 8). **This section had the lowest average density (88.2%) of all test sections.**

Thus, it appears that current specifications (which allow for 150-200 mm (6-8 in.) of pulverized material to be compacted by a minimum 22624 kg (25 ton) rubber tired roller with 621 kPa (90 psi) tire pressure *or* 11312 kg (12 ½ ton) vibratory pads foot roller, and a minimum 7240 kg (8 ton) vibratory steel wheeled roller) **may need further investigation or modification with respect to type of compaction equipment used.** In this case study, sufficient densities (92-93%)* are not attainable with a rubber tired roller alone at the 254 mm (10 in.) depth. **The vibratory pads foot roller needs to work the material before other compaction equipment compacts the top few centimeters in order to achieve sufficient density.**

An analogy would be akin to filling a five gallon bucket full of leaves. It is difficult to achieve compaction once the bucket is full, whereas if the leaves are compacted as new leaves are added, one can fit more leaves in the bucket and thus achieve greater “density”. Hence, in much the same way, the vibratory pads foot roller essentially compacts from the “bottom” as per the above analogy, thus providing increased density.

* Based on past WisDOT field experiences, not part of any specification.

TEST SECTION 4 (Split Lift)

Test Section 4 (station 17 + 333 to station 19 + 980), referred to as the “happenstance” section, resulted from circumstances that took place during construction. Many passes were made by all types of rollers used as the electronically-controlled grader made adjustments and regraded the area. This is noteworthy in that this test section had the highest density readings (Tables 1 and 6).This section will be monitored for future pavement performance along with the other test and control sections. Due to increased construction costs and efficiency reasons, this method may not prove to be cost-effective from a construction standpoint, however, an attempt will be made to determine the cost-effectiveness based on actual pavement performance.

INITIAL IRI / RUT / PDI MEASUREMENTS

The table below shows the initial performance data. The Pavement Distress Index (PDI), International Roughness Index (IRI) and rut measurements were taken in November of 1998 (five months after construction). It is interesting to note that the east bound lane had a slightly rougher ride (IRI) and also showed slightly higher rut measurements as collected by the Wisconsin Road Profiler. The IRI ranges from 0 (best ride) to about 8 (worst ride). IRI values are an average of the entire length of each test section, as are the RUT measurements listed in the table below. Typical IRI values for new construction on asphaltic pavements average about 1.0.

IRI = International Roughness Index

	IRI (m/km)		RUT (inches)	
	East	West	East	West
Actual Control (Control 2)	1.05	0.87	0.02	0.02
Test Section 3	1.13	0.88	0.03	0.02
Test Section 1	1.05	0.83	0.04	0.01

Test Section 2	1.10	0.78	0.03	0.02
Proposed Control (Control 1)	0.92	0.85	0.03	0.02
Test Section 4	1.00	0.90	0.03	0.02

The PDI for all sections had a value of 3.8. The PDI ranges from 0 (no distress) to 100 (worst distress). It was observed that segregation occurred every few hundred feet throughout the entire project length at points where new loads of hot-mix asphalt were unloaded to the asphalt paver. As such, it will be noted in future analysis when considering total pavement performance.

Rut measurements were obtained December 4th, 1998, with a straight edge. Measurements were taken 0.9 meters (3 ft.) in from the edge paint line for both the east and west bound lanes. From there, measurements were taken every 14 meters (45 ft.) heading east for five iterations. This resulted in a total of ten rut measurements for each test section (five for each lane). These results are tabulated in Table 9.

Signing of the test and control sections was completed December 4th, 1998. The signs were placed along the east bound lane of the roadway and were sited to indicate the start of the PDI evaluation sections. As such, the signs do not denote the start of the test sections per se, but are actually denoting the start of the 500' PDI survey sections within each respective test and control sections.

The contractor for this job was Murphy Construction Company. It is noted that they were extremely cooperative in allowing WisDOT staff to complete density testing and to add the additional full depth rubber tire only test section.

DISCUSSION / INCIDENTALS

It was observed that the pulverized base material was not uniform in gradation, as some areas were rather sandy while other areas were more "chunky" and gravely (Figure 4). Proctor values from these areas ranged from 2238 kg/m^3 (139.7 lb./ft.^{3}) at 7.1 % moisture to 2331 kg/m^3

(145.5 lb./ft.^{3}) at 6.0 % moisture, but the majority of the pulverized base within 4.5 m (15 ft.) of the centerline had a proctor value of 2278 kg/m^3 (142.2 lb./ft.^{3}) at 6.1 % moisture.

The pulverized road was subjected to compaction by construction and vehicle traffic over the weekend. This necessitated raking the material with a scarifier or ripper on the back of a grader to loosen up the material to allow for the introduction of water (Figures 4a-5a). It has been found that watering of the pulverized material prior to and during compaction of the material is critical for getting sufficient density (92-93% and up) throughout the pulverized depth*.

It was observed that fully loaded dump trucks and other heavy construction equipment did not sink into the compacted base for all sections, i.e., no noticeable or appreciable flexing of the roadbed was apparent.

Part of this project was mill only, where the top 30 mm (1.2 in.) of the asphaltic pavement was milled and relayed with a 40 mm (1.6 in.) lower layer and a 40 mm (1.6 in.) upper course. A tack coat was applied in-between the lifts. It was decided (just prior to publishing this report) to include a mill-only section for comparison purposes.
Thus a mill-only section will be monitored for pavement performance as it relates to crack development and maintenance. See map on page 11 for the location of this section.

RESULTS / CONCLUSIONS

1.) Split lift test sections had significantly higher densities (at the 90% confidence level) than the full depth test sections.
2.) The use of a rubber tired roller as the primary compactor on a full depth 254 mm (10 in.) lift did not achieve sufficient density. In this case study, sufficient densities (92-93%)* are not attainable with a rubber tired roller at the 254 mm (10 in.) depth.
3.) The vibratory pads foot roller needs to work the material before other compaction equipment compacts the top few centimeters in order to achieve sufficient density.

* Based on past WisDOT field experiences, not part of any specification.

4.) From this case study, the use of a vibratory pads foot roller on full depth test sections (254 mm, 10 in.) appears to achieve satisfactory densities.

5.) The use of a rubber tired roller for split lift compaction was not part of this project.

RECOMMENDATIONS

Based on this case study and data from previous pulverize projects, the technical oversight committee for this project recommends that the standard special provisions for pulverize and relay be amended to take the following into account:

> Immediately after pulverizing, the material shall be placed as shown on the plans. The laydown shall be accomplished using a paver and/or grader. Prior to paving, the pulverized material shall be scarified, as determined by the engineer, to aid in loosening the material for final grading.
>
> The contractor shall be responsible for keeping the pulverized surface relatively smooth, as determined by the engineer, during exposure to temporary traffic. This work shall include keeping the pulverized surface free of excessive rutting, raveling or pot holes.

An optional special provision to include with the revised specification, if deemed appropriate, is shown below:

> The final grading of the pulverized material shall be accomplished with an automatic grade and slope control system to permit the operator to adjust or vary the slope throughout super-elevated curves, transitions and tangent sections. The grader shall utilize a traveling straightedge for the sensors to ride on.
>
> In the event of a breakdown of the automatic control system, the grader may operate with manual controls for the remainder of that day only.

Based on the initial findings of this case study, further testing and compaction on full-depth 200 mm (10.0 in.) test sections is being carried out and evaluated for sufficient density based on compaction equipment used, i.e. rubber tired roller vs. vibratory pads foot roller. Then, based on this final study, revisions to the specification will be addressed with minimal density requirements likely to be incorporated into the revisions.

Table 1. **DENSITY MEASUREMENT RESULTS**

STH 54, Outagamie County Pulverize & Relay, June 1998

Proposed Control Section
(Std. Const. with Split Lifts)

Station 16 + 300 to Station 16 + 700

			% Density		% Moisture	
			@ 10"	@ 4"	@ 10"	@ 4"
Proposed		Test Site				
Control Section	Split Lift	1	89.9	94.0	9.0	8.4
		2	91.0	95.5	8.2	7.6
		3	95.3	99.5	6.7	6.5
		4	86.6	89.2	8.0	7.9
		5	86.2	90.0	8.2	7.6
		6	89.7	92.7	8.2	8.2
		Average	**89.8**	**93.5**	**8.1**	**7.7**
		Range	**9.1**	**10.3**	**2.3**	**1.9**

Density Summary			% Density			**10" & 4"**
			@ 10"	@ 4"	**Range**	**Average**
Test Section 4	Split Lift, extensive gradi	**Average**	93.8	95.0	**1.2**	**94.4**
Actual Control	Split Lift w/Vibratory Pads	**Average**	94.2	94.3	**0.1**	**94.3**
Test Section 1	Split Lift w/Vibratory Pads	**Average**	92.3	95.8	**3.5**	**94.1**
Test Section 2	Full Depth w/Vibratory Pa	**Average**	92.0	93.1	**1.1**	**92.6**
Proposed Control	Split Lift	**Average**	89.8	93.5	**3.7**	**91.7**
Test Section 3	Full Depth w/Rubber Tire	**Average**	87.5	88.9	**1.4**	**88.2**

*Mosture readings as recorded by Nuclear Machine.

** Past experience shows actual H20 content to be about 40% of the Nuclear indicated moisture.

Table 2.

Test Section 2
(Full Depth)

Station 15 + 200 to Station 15 + 600

			% Density		% Moisture	
			@ 10"	@ 4"	@ 10"	@ 4"
Test Section 2	(Full Depth w/Vibratory	Test Site				
	Pads Foot Roller)	1	92.4	91.9	8.6	8.5
		2	95.5	98.9	9.6	9.4
		3	92.4	96.8	11.7	11.1
		4	90.8	89.5	9.4	9.5
		5	91.1	90.9	7.8	7.8
		6	89.8	90.6	7.6	7.7
		Average	**92.0**	**93.1**	**9.1**	**9.0**
		Range	**5.7**	**9.4**	**4.1**	**3.4**

Table 3. **DENSITY MEASUREMENT RESULTS**

STH 54, Outagamie County Pulverize & Relay, June 1998

Test Section 1 Station 14 + 800 to Station 15 + 200

(Split Lift w/Vibratory Pads Foot Roller)

		% Density			% Moisture	
		@ 10"	@ 6"	@ 4"	@ 10"	@ 6"
Test Section 1	Test Site					
	1	91.9	88.9	97.9	9.7	6.3
	2	94.3	89.5	95.8	8.9	9.5
	3	90.4	92.9	95.4	9.8	12.3
	4	92.6	87.3	95.3	9.2	6.7
	5	96.4	89.9	98.4	9.6	10.6
	6	87.9	93.8	92.0	9.9	8.1
	Average	**92.3**	**90.4**	**95.8**	**9.5**	**8.9**
	Range	**8.5**	**6.5**	**6.4**	**1.0**	**6.0**

*Mosture readings as recorded by Nuclear Machine.

** Past experience shows actual H_20 content to be about 40% of the Nuclear indicated moisture

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Table 4.

Test Section 3 (With Rubber Tired Roller as the Primary Compactor)
(Supplemental Full-Depth)

Station 14 + 460 to Station 14 + 800

			% Density		% Moisture	
			@ 10"	@ 4"	@ 10"	@ 4"
Test Section 3	Full Depth w/ Rubber Tire Roller	Test Site				
		1	87.9	90.4	10.0	9.3
		2	87.2	89.2	8.3	7.7
		3	87.5	87.1	9.6	8.5
		Average	**87.5**	**88.9**	**9.3**	**8.5**
Proposed Control	Split Lift	**Average**	**89.8**	**93.5**	**8.1**	**7.7**
Test Section 2	Full Depth w/Vibratory Pads Foo	**Average**	**92.0**	**93.1**	**9.1**	**9.0**
Test Section 1	Split Lift w/Vibratory Pads Foot	**Average**	**92.3**	**95.8**	**9.5**	**9.2**
Test Section 4	Split Lift w/extensive grading	**Average**	**93.8**	**95.0**	**9.8**	**8.9**
Actual Control	Split Lift w/Vibratory Pads Foot	**Average**	**94.2**	**94.3**	**10.2**	**10.4**

Table 5. **DENSITY MEASUREMENT RESULTS**

STH 54, Outagamie County Pulverize & Relay, June 1998

Actual Control Section Station 14 + 150 to Station 14 + 550

(Std. Const. with Split Lifts)

		% Density		% Moisture	
		@ 10"	@ 4"	@ 10"	@ 4"
Actual Control	Test Site				
(w/Vibratory Pads Foot Ro	1	93.5	93.1	10.2	10.4
	2	92.8	94.8	10.9	10.8
	3	91.1	91.5	9.3	9.5
	4	94.0	95.5	10.5	10.5
	5	98.2	94.7	10.4	11.1
	6	95.5	96.4	10.1	10.2
	Average	**94.2**	**94.3**	**10.2**	**10.4**
	Range	**7.1**	**4.9**	**1.6**	**1.6**

*Mosture readings as recorded by Nuclear Machine

** Past experience shows actual H_2O content to be about 40 % of the Nuclear indicated moisture.

Table 6.

Test Section 4 (Std. Const. with Split Lifts)
(Extensive grading, regrading and compaction)

Station 17 + 333 to Station 19 + 980

		% Density		% Moisture	
		@ 10"	@ 4"	@ 10"	@ 4"
Test Section 4	Test Site				
	1	93.9	92.7	9.4	9.4
	2	96.2	91.2	8.7	8.6
	3	92.1	92.7	8.4	11.1
	4	93.7	95.4	10.7	10.1
	5	92.5	97.8	10.6	10.1
	6	89.7	95.0	11.8	11.1
	7	96.4	99.8	11.6	11.4
	8	96.1	100.9	11.9	11.0
	9	94.0	94.0	9.5	9.6
	10	96.5	95.8	8.1	8.2
	11	93.6	94.9	9.6	9.6
	12	96.2	96.1	8.6	8.7
	13	93.5	94.2	8.7	8.5
	14	88.7	90.1	8.9	7.3
	Average	**93.8**	**95.0**	**9.8**	**8.9**
	Range	**7.8**	**10.8**	**3.8**	**4.1**

Table 7. **DENSITY MEASUREMENT RESULTS**

STH 54, Outagamie County Pulverize & Relay, June 1998

Retest Comparison Analysis

Test Section 2 Station 15 + 200 to Station 15 + 600

(Full Depth)

		% Density		% Moisture	
		@ 10"	@ 4"	@ 10"	@ 4"
Test Section 2	Test Site	These cells left blank because they are not used in the retest comparison analysis			
(Full Depth w/Vibratory Pads	1				
Foot Roller)	2				
	3				
	4	90.8	89.5	9.4	9.5
	5	91.1	90.9	7.8	7.8
	6	89.8	90.6	7.6	7.7
	Average	**90.6**	**90.3**	**8.3**	**8.3**
Retest Results	4	91.7	91.4	6.9	7.1
Following Day	5	89.9	92.3	7.5	7.6
	6	90.6	90.4	8.0	7.4
	Average	**90.7**	**91.4**	**7.5**	**7.4**
	Difference	**+0.1%**	**+1.1%**	**-0.8%**	**-0.9%**

*Mosture readings as recorded by Nuclear Machine

** Past experience shows actual H_2O content to be about 40 % of the Nuclear indicated moisture.

Table 8.

(With Rubber Tired Roller as the Primary Compactor)

Test Section 3 Station 14 + 460 to Station 14 + 800

(Full Depth)

		% Density		**% Moisture**	
		@ 10"	@ 4"	@ 10"	@ 4"
Test Section 3	Test Site				
(w/Rubber Tire Roller)	1	87.9	90.4	10.0	9.3
	2	87.2	89.2	8.3	7.7
	3	87.5	87.1	9.6	8.5
	Average	**87.5**	**88.9**	**9.3**	**8.5**
Retest Results	1	89.3	89.3	9.1	9.3
after pass with	2	85.5	87.5	6.6	7.7
vibratory sheep's	3	87.9	92.3	10.0	8.5
foot roller	**Average**	**87.6**	**89.7**	**8.6**	**8.5**
	Difference	**+0.1%**	**+0.8%**		

December 4, 1998 **STRAIGHT EDGE RUT MEASUREMENT RESULTS**

Pulverize, Mill & Relay Asphaltic Pavement and Base Course

Test Section	Readings	East Lane	West Lane
Test Section 4	1	0.03	0.00
(Split Lift	2	0.03	0.03
w/extensive grading, co	3	0.01	0.01
	4	0.06	0.01
	5	0.01	0.01
	Average	**0.028**	**0.012**
Proposed Cont	1	0.04	0.00
(Split Lift)	2	0.04	0.10
	3	0.03	0.05
	4	0.01	0.02
	5	0.01	0.03
	Average	**0.026**	**0.040**
Test Section 2	1	0.03	0.02
(Full Depth	2	0.00	0.03
w/Vibratory Pads Foot	3	0.01	0.02
	4	0.00	0.01
	5	0.00	0.02
	Average	**0.008**	**0.020**
Test Section 1	1	0.02	0.01
(Split Lift	2	0.01	0.02
w/Vibratory Pads Foot	3	0.02	0.02
	4	0.01	0.03
	5	0.00	0.01
	Average	**0.012**	**0.018**
Test Section 3	1	0.01	0.02
(Full Depth	2	0.02	0.02
w/Rubber Tired Roller)	3	0.02	0.01
	4	0.01	0.01
	5	0.01	0.02
	Average	**0.014**	**0.016**
Actual Control	1	0.02	0.03
(Split Lift	2	0.00	0.01
w/Vibratory Pads Foot	3	0.01	0.04
	4	0.01	0.01
	5	0.02	0.02
	Average	**0.012**	**0.022**

STH 54, Outagamie Co.

Notes:

Measurements in hundredths of an inch.

Measurements taken three feet from pavement edge line.

Reading 1 is at the sign
Reading 2 is 15 paces east of sign
Reading 3 is 30 paces east of sign
Reading 4 is 45 paces east of sign
Reading 5 is 60 paces east of sign

Signs are sited to indicate the start of the PDI evaluation sections. (as opposed to the actual start of the test sections)